

What is claimed is:

1. A positioning apparatus, wherein

5 a reference member (R) is provided with a support surface (S) for supporting a movable member (M) and a central pillar (21) projected from the support surface (S) toward a leading end,

a positioning hole (12) is opened in a surface (T) to be supported of the movable member (M),

10 a shuttle member (23), which is diametrically expandable and contractible, is arranged between the central pillar (21) and the positioning hole (12),

the shuttle member (23) is supported on either the central pillar (21) or the positioning hole (12) axially movably, and the shuttle member (23) is adapted to make a tapering engagement indirectly with the other (12, 21) via a tapered cylinder (26), which narrows toward the leading end,

15 the tapered cylinder (26) is attached to the shuttle member (23), the shuttle member (23) is adapted to be pushed in such a direction as to tighten the tapering engagement by means of an advancing means (24).

2. A positioning apparatus as set forth in claim 1, wherein

20 an inner peripheral surface of the shuttle member (23) is composed of a straight surface (27) and an outer peripheral surface of the shuttle member (23) is composed of a tapered surface (28), which narrows toward the leading end, the straight surface (27) is supported on the central pillar (21) axially movably, and the tapered surface (28) is adapted to make a tapering engagement with the positioning hole (12) via the tapered cylinder (26).

3. A positioning apparatus as set forth in claim 1, wherein

25 an outer peripheral surface of the shuttle member (23) is composed of a straight surface (27) and an inner peripheral surface of the shuttle member (23) is composed of a tapered surface (28), which narrows toward the leading end, the straight surface (27) is supported on the positioning hole (12) axially movably, and the tapered surface (28) is adapted to make a tapering engagement with the central pillar (21) via the tapered cylinder (26).

4. A positioning apparatus, wherein

a reference member (R) is provided with a support surface (S) for supporting a movable member (M) and a central pillar (21) projected from the support surface (S) toward a leading end,

35 a positioning hole (12) defined by a tapered hole is opened in a surface (T) to be supported of the movable member (M),

a intermediate member (22) is arranged between the central pillar (21) and the positioning hole (12),

the intermediate member (22) is composed of a collet-type shuttle member (23) having on an outer periphery a tapered surface (28), which narrows toward the leading end, and a tapered cylinder (26), which is attached to the outer periphery of the shuttle member (23) and makes a tapering engagement with the positioning hole (12),

the collet-type shuttle member (23) is supported on the central pillar (21) axially movably, and the inner peripheral surface of the tapered cylinder (26) makes a tapering engagement with the tapered surface (28) on the outer periphery of the shuttle member (23), and an advancing means (24) is provided so as to push the shuttle member (23) in such a direction as to tighten the tapering engagement.

5. A positioning apparatus, wherein

a reference member (R) is provided with a support surface (S) for supporting a movable member (M) and a central pillar (21) projected from the support surface (S) toward a leading end,

a positioning hole (12) defined by a straight hole is opened in a surface (T) to be supported of the movable member (M),

a intermediate member (22) is arranged between the central pillar (21) and the positioning hole (12),

the intermediate member (22) is composed of a collet-type shuttle member (23) having on inner periphery a tapered surface (28), which narrows toward the leading end, and a tapered cylinder (26), which is attached to the inner periphery of the shuttle member (23) and makes a tapering engagement with the central pillar (21),

the collet-type shuttle member (23) is supported on the positioning hole (12) axially movably, and an outer peripheral surface of the tapered cylinder (26) makes a tapering engagement with the tapered surface (28) on the inner periphery of the shuttle member (23), and an advancing means (24) is provided so as to push the shuttle member (23) in such a direction as to tighten the tapering engagement.

6. A positioning apparatus as set forth in claim 1, wherein

the tapered cylinder (26) has a peripheral wall formed integrally in a circumferentially seamless manner.

7. A positioning apparatus as set forth in claim 1, wherein

at least either the leading end part or a base end part of the tapered cylinder (26) is supported on the reference member (R) or the movable member (M) hermetically.

8. A positioning apparatus as set forth in claim 1, wherein

a clamp means (30), which presses the movable member (M) toward the

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reference member (R), is provided.